

Claims

1. A safety system for aircraft, wherein prohibited airspaces (6, 6', 6'', 43) which aircraft may not enter are marked on a digitally stored image of the airspace, wherein the aircraft (41) is provided with an automatic control device (24, 29), and wherein on approaching a prohibited airspace (6, 6', 6'', 43) the control device (24, 29) automatically steers the aircraft (41) on to an alternative route (50) which is situated outside the prohibited airspace (6, 6', 6'', 43).
2. A safety system according to claim 1, characterised in that the height of the prohibited airspace (6, 6', 6'', 43) is greater than the height which can be reached by the aircraft.
3. A safety system according to either one of claims 1 or 2, characterised in that the automatic control is only activated after the input of a command, and that the automatic control can only be deactivated in a secure manner.
4. A safety system according to any one of the preceding claims, characterised in that the automatic control can only be deactivated by a device (36) situated outside the aircraft (41).
5. A safety system according to any one of the preceding claims, characterised in that the automatic control can only be deactivated on the ground.
6. A safety system according to any one of the preceding claims, characterised in that the automatic control includes an automatic landing.
7. A safety system according to claim 6, characterised in that the location of the automatic landing can be predetermined by a device (36) situated outside the aircraft (41).

8. A safety system according to any one of the preceding claims, characterised in that on the alternative route (50) control can be taken over by a device (36) situated outside the aircraft (41).
9. A safety system according to any one of the preceding claims, characterised in that when the automatic control is activated a message is sent to a device (36) for air traffic control.
10. A safety system according to any one of the preceding claims, characterised in that automatic control is also effected if an approach to moveable objects (45) occurs.
11. A safety system according to any one of the preceding claims, characterised that in addition the aircraft is automatically steered on to an alternative route if it approaches other objects, particularly other aircraft.
12. A safety system according to any one of the preceding claims, characterised in that
 - the airspace is divided into predetermined volume elements (10),
 - that, for the aircraft (41), probabilities are calculated with which the aircraft (41) will be situated in predetermined volume elements at a plurality of selected points in time (residence probabilities),
 - that the probabilities of the residence of the aircraft (41) in each volume element (collision probabilities) are calculated for the predetermined volume elements (10) and for the selected points in time from the residence probabilities of the aircraft (41) and from residence probabilities, which are set to one, of the volume elements of the prohibited airspace (43), and
 - that an alternative route (50) is calculated if the collision probability exceeds a predetermined value for at least one volume element (10).
13. A safety system according to claim 12, characterised in that, as a test, a plurality of alternative routes (47, 48, 49, 50) with a deviation which increases from alternative route to alternative route is calculated according to recognised or established alternative rules, and that the calculated alternative route (50) which, at the smallest deviation, results in a

probability of entry into the prohibited airspace (43) which is less than a predetermined threshold value is selected and is converted into a control command.

14. A safety system according to either one of claims 12 or 13, characterised in that when a limiting deviation is reached without the probability of entry into the prohibited airspace (43) being correspondingly reduced, alternative routes (50) in another direction are calculated.

15. A safety system according to any one of claims 12 to 14, characterised in that residence probabilities of other objects (45) are additionally taken into consideration for the calculation of the alternative route (50).

16. A safety system according to any one of claims 12 to 15, characterised in that for volume elements which are situated in an edge region (44) around the prohibited airspace (43) the residence probabilities are set to a lesser value than that of the prohibited airspace (43).

17. A safety system according to any one of the preceding claims, characterised in that a warning signal for the pilot is emitted if the aircraft (41) approaches a prohibited airspace (43).

18. A safety system according to any one of the preceding claims, characterised in that a warning signal for the pilot is emitted if the safety system takes over the automatic control of the aircraft (41).

19. A safety system according to any one of the preceding claims, characterised in that prohibited airspaces (43) are displayed on a screen (30), preferably on a navigation display, and the alternative routes (50) are displayed which are calculated if necessary.

20. A safety system according to any one of the preceding claims, characterised in that the position of the aircraft (41), the airspace, and the alternative route (50) which exists if necessary, are displayed on a display device (30, 36).